

REMARKS

Claims 1-21 are all the claims pending in the application.

Reconsideration and review of the claims on the merits are respectfully requested along with entry of the amendment to the specification.

Preliminary Items

Applicants kindly appreciate that, on the Office Action Summary sheet, the Examiner has acknowledged receipt of certified copies of the priority documents.

Applicants also appreciate that the Examiner has returned a signed and initialed Information Disclosure Statement filed on July 16, 2001.

Election/Restriction

Applicants' election without traverse of Group I (claims 1-15, 18 and 19) is acknowledged by the Examiner. Claims 16-17 and 20-21 are withdrawn from consideration.

Claim Rejections - 35 U.S.C. § 112

Claims 8 and 9 are rejected under 35 U.S.C. § 112, second paragraph, as assertedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner states that the claims include the limitation "*wherein the number of said hydrogen atoms is at least the number of total deficits of total oxygen atoms and metal atoms*"; the Examiner is unclear what are the means and bounds of the claimed invention language.

Applicants respectfully traverse the rejection.

The bridging paragraph at pages 18-19 and its context therein, for example, provide clarification for the limitation “*wherein the number of said hydrogen atoms is at least the number of total deficits of total oxygen atoms and metal atoms*”. Applicants submit that the metes and bounds of this limitation is clear to a skilled artisan.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the indefiniteness rejection.

Claim Rejections - 35 U.S.C. § 103

Claims 1-5, 18 and 19 are rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Applicants’ admitted prior art as shown on Figures 1-3B and their descriptions on pages 1-9 of the instant application in view of Sonoda et al (U.S. Patent No. 4,258,080) for the reasons given in the Office Action.

The Examiner recognizes that Applicants’ disclosed references fail to teach the volume resistivity of the protective film as claimed. However, the Examiner states that Sonoda discloses a method on which a metal oxide semiconductor or a conductive material of a desired resistivity can be obtained by controlling the quantity of an unsaturated metal halide. The Examiner concludes that it would have been an obvious modification to someone with ordinary skill in the art to modify the structure as taught by Applicants’ admitted prior art to include the volume resistivity as claimed, as suggested by Sonoda, in order to reduce sputtering effect and reduce driving voltages.

Applicants respectfully traverse the rejection in view in Sonoda.

Sonoda does not disclose, teach or suggest the claim limitation in Claim 1 of the protective film having a volume resistivity of $3.5 \times 10^{11} \Omega\cdot\text{cm}$ or more. On the contrary, Sonoda discloses values for specific resistivity in Tables 1 and 2 nowhere near the order of $10^{11} \Omega\cdot\text{cm}$ or more required in the present invention (See Sonoda, cols. 3-4). The values for specific resistivity of Sonoda would not achieve the benefits of the present invention. Furthermore, Sonoda actually teaches away from the present invention by teaching that a resistivity of an n-type metal oxide semiconductor is lowered by treating the metal oxide with a metal halide (see Sonoda's Abstract). Accordingly, Sonoda's teachings would not have been obvious to modify to achieve the present invention.

The inventors of the present invention found that the volume resistivity and hydrogen atom content are closely related to the discharge delay time of writing and discharge voltage in the PDP, and with defining them in an appropriate range, i.e. the claim limitation in Claim 1 of the protective film having a volume resistivity of $3.5 \times 10^{11} \Omega\cdot\text{cm}$ or more, shortening of discharge delay time, lowering of discharge voltage and improvement of brightness are attained (see page 10, fourth full paragraph; and Fig. 4).

With regard to Claims 2 and 3, a further difference between the claimed invention and Applicants' admitted prior art is, three hydrogen atoms or more when the number of total atoms in said protective film is defined as 100. Applicants disagree with the Examiner that it would have been an obvious modification to modify the structure as taught by Applicants' admitted prior art to include the quantity of hydrogen and nitrogen atoms as claimed.

The present inventors have discovered the following relationship between the hydrogen content and the discharge delay time. Fig. 11 is a graph showing the relationship between the hydrogen content and the discharge delay time in which an abscissa indicates the hydrogen content (the number of hydrogen atoms when the number of total atoms of the protective film is defined as 100) and an ordinate indicates the discharge delay time (See pages 23-26).

As shown in Fig. 11, as the hydrogen content is increased, the discharge delay time is shortened. As mentioned above, the discharge delay time depends on the driving method of PDP, the shape of discharge cell and the like. Further, an allowable range of the discharge delay time depends on the number of scan lines and the driving method. In the PDP used when obtaining the graph shown in Fig. 11, when the discharge delay time becomes about 1.8 μ s or more, the dual scan of PDP is required for securing the scan period. Further, since the scan pulse width needs to be set longer, the number of sustaining pulses is restricted so that it is difficult to obtain sufficient luminance. In this regard, when the discharge delay time is less than 1.8 μ s, the number of driving circuits can be decreased because it is possible to secure the sufficient scan period by the single scan. Further, because the scan pulse corresponding to the width as much as restricting the number of sustaining pulses is not needed, sufficient luminance can be obtained.

The inventors of the present invention also found the following nonobvious relationship between the hydrogen content and the priming completion voltage. Fig. 12 is a graph showing the relationship in which an abscissa indicates the hydrogen content (the number of hydrogen atoms when the number of total atoms of the protective film is defined as 100) and an ordinate indicates the priming completion voltage. The priming completion voltage means the lowest

voltage that the priming voltage is uniformly formed in the PDP display plane without generating the writing badness and the error lighting. The lower the priming setting voltage is, the more the display contrast is improved, but when the priming setting voltage becomes close to the completion voltage, the writing badness and the error lighting are easily occurred. Accordingly, 20 to 50V higher voltage than the conventional priming completion voltage is set for the priming setting voltage. Practically, in the PDP used when obtaining the graph shown in Fig. 11, when the priming completion voltage is 180V or more and the priming voltage is not more than 200V, incidence rate of the writing badness and the error lighting was increased.

The priming setting voltage used when obtaining the graph shown in Fig. 11 is measured by setting 20 to 50V higher voltage than the priming completion voltage. As such, in case where the priming setting voltage is set with an enough margin with respect to the priming completion voltage, the discharge delay time does not depend on the priming setting voltage. Such a tendency is not changed although the driving method or the shape of discharge cell is changed.

Accordingly, the hydrogen content is defined as 3 atoms or more when the number of total atoms of the protective film is defined as 100.


With regard to the dependent Claims 4-15 and 18-19, the dependent claims each incorporate the subject matter of independent Claims 1 or 3. Accordingly, since Claims 1 and 3 distinguish Sonoda, and the other cited references to M.O. Aboelfotoh, Furuya, Aoki (JP Laid-Open No. 11-3665) and Aoki (U.S. Patent No. 5,993,543) do not make up for the deficiencies of Sonoda, the §103 rejection should be reconsidered and withdrawn.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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WASHINGTON OFFICE



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PATENT TRADEMARK OFFICE

THE FEDERAL GOVERNMENT WAS
CLOSED ON THURSDAY,
SEPTEMBER 18 AND FRIDAY,
SEPTEMBER 19, 2003. THEREFORE,
THIS AMENDMENT IS TIMELY
FILED.

Date: September 22, 2003